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Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education

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Abstract

The need for usage of technologies which removes the boundaries of time and location increases day by day today when information and accession to information gains importance. Effect of mobile learning to education is an issue to be researched in order to provide lifelong learning. The fact that mobile devices are small and they have got with a lot of features despite their size increases interest for them. This increasing interest requires more study on these devices or causes the usage of these devices in more fields. The feature of mobile devices that enable educational atmosphere encourages individuals for their usage. Besides, it enables an educator who shares the information to contact more students independent of time and location with the usage of mobile devices in education. Mobile learning is explained in a detailed way in this study. Besides, the relation and differences between m-learning and e-learning are put forth with their details. On some important issues such as internet accession and usage status in Turkey, technological devices used in mobile learning and communication technologies are also studied.

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Keywords: Mobile learning, m-learning, e-learning, mobile technology, distant education, mobile devices.

1. Introduction

21. century, called as the ‘Information Age’, brought along with itself an era where computer technologies develop rapidly and become widespread among all levels of the community. (Isman, 2006)

Alkan, 2002; stated that the 2000’s are based on the scientific and technological developments because of their being scientific and technological age, that scientific and technological developments of the 2000’s increase global, national and individual necessities and they require new structuring in education and that education has 1) Science, 2) Technology and 3) Application dimensions.

Distance Learning (UE), which provides those who possess different demographical and cultural backgrounds in different places and aren’t able to continue formal education, is becoming widespread in the entire world and is accepted as the education system in the future (Girginer, 2002).

With the developing technology, distance learning has increased to a level to serve the notion of life-long learning. The last ring of the works done by education world fort his purpose is called ‘mobile learning’. Mobile learning is a candidate system to fill the deficiency of former distance learning systems with mobile technologies as well (Inceoglu, 2006).

Harris, 2001; defines mobile learning as an point interacted to provide mobile computer technologies and internet-based learning to be ‘everytime, everywhere’ learning experience. Grosso, 2003; defines mobile learning as an obtainment of every kind of information and ability by using mobile technologies.

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With mobile learning, there occur changes in learning environment, with the opportunity of learning independent of time and location, in this context, Keegan (2002) states that mobile learning is the type of learning in the future and that learning environment is designed by wireless technologies, and Barbosa and Geyer (2005) state that so long as learners move, they also carry the learning environment physically (Transfer by Laouris, Y. & Eteokleous, N. (2005).

Mobile learning is a type of learning which appeared as a conclusion of co-evaluation of ‘mobile informatics’ and e-learning fields, provides accession to e-learning content independently of a specific location, utilization of services created dinamically and communication with others. Mobile learning can be used to support traditional learning (Wang, 2004) as well as distance learning (Mutlu, M.E & others, Barbara et al., 2005).

As Mutlu, M.E and others state, laptops, tablet computers, pocket PCs with phones, pocket PCs, portable media players, MP3 players and smart phones exist within mobile informatics devices.

Georgiev, T and others state that mobile learning is a part of e-learning, m-learning should provide learning without any physical network connection everytime and everywhere, communication technologies of GSM, WAP, GPRS, Bluetooth, IEEE 802.11 are used by mobile devices.

M-learning is a distance learning model which is designed to meet education needs with the help of mobile devices. Thanks to m-learning, there appeared an education model which can be very beneficial for students with providing the opportunity of education independent of time and environment.

1.1. Mobile Learning

The rapid progress of information technologies in our age has increased the interest of technology towards peoples’ needs. While technological devices and usage of these were subject to a specific environment or location in the past, environment and location now have their independent specialities for the past recent times.

Mobile learning is a type of learning whose learner is determined previously, is not in a specific location, or benefits the opportunities offered by mobile technologies (O’Malley, Vavoula, Glew, Taylor, Sharples & Lefrere, 2003).

Keegan (2001) defines mobile learning as running of education through PDAs, pocket PCs and mobile phones. The speciality rendering mobile learning more advantageous than e-learning is the distribution of mobile device usage.

Developing informatics technologies and technological devices have progressed rapidly in education field in our times. Informatics technologies used in education have progressed rapidly and dependably in such a way that traditional education methods have left their importance to technological education methods. This progress revealed the notion of e-learning.

With the support by today’s mobile technologies to e-learning within d-learning (distance learning) concept, the notion of m-learning provided technological progress in education.

Although e-learning has much more advantages than traditional education methods, some deficiencies of its own have lead science world to new pursuits. the development of mobile Technologies and the need for movement of the technology in education to new dimensions have revealed the new notion m-learning. The most important advantage of m-learning to e-learning is accession by the student to demanded information independent of time and environment.

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If we analyze mobile education in terms of its advantages, we can range them as follows;

- Life-long learning,
- Learning inadvertently,
- Learning in the time of need,
- Learning independent of time and location,
- Learning adjusted according to location and circumstances (Bulun & others, 2004).

1.1.1. Different points of m-learning from e-learning

Most writers observe m-learning as a naturally evolved form of e-learning. However this opinion has some deficiencies. E-learning occurred as a new form of distance learning and its terminology is close to those of

traditional learning. But although the applications of m-learning are seen as an evolution of e-learning, m-learning is a characterized technology and has its own terminology. For instance, while the terms multimedia, interactive, hyperlinked, media-rich environment are among the terminology of e-learning; terms like spontaneous, intimate, situated, connected, informal, lightweight are among the terminology of m-learning.

1.1.1.2. Terminology comparison between e- and m-learning (N. Eteokleous & Y.Laouris, 2005)

Table.1.Terminology comparison between e- and m-learning

e-learning	m-learning
Computer	Mobile
Bandwidth	GPRS, G3, Bluetooth
Multimedia	Objects
Interactive	Spontaneous
Hyperlinked	Connected
Collaborative	Networked
Media-rich	Lightweight
Distance learning	Situated learning
More formal	Informal
Simulated situation	Realistic situation
Hyperlearning	Constructivism, situationism, collaborative

1.1.1.3. Student to Student Communication

Table.2. Student to Student Communication

Face-to-Face	Flexible
Audio-teleconference common	Audio- and video-teleconference possible
e-mail-to-e-mail	24/7 instantaneous
Private Location	No geographic boundaries
Travel time to reach to internet site	No travel time since wireless connectivity
Dedicated time for group meetings	Flexible timings on 24/7 basis
Poor communication due to group consciousness	Rich communication due to one-to-one communication, reduced inhibitions

1.1.1.4. Differences between e- and m-Learning environments with respect to methods of evaluation (Modified from Sharma & Kitchens 2004)

Table.3. Assignments & Tests

In-class or on computer	Any location
Dedicated time	24/7 Instantaneous
Restricted amount of time	Any amount of time possible
Standard test	Individualized tests
Usually delayed feedback	Instant feedback possible
Fixed-length tests	Flexible-length/number of questions

2. Basic Terminology

2.1. Technological Devices used in m-learning

Important mobile devices progressing gradually and used in m-learning are listed as follows; Servers, laptop computers, tablet computers, smart phones, pocket computers, portable media players, MP3 players, video players. If we analyze these mobile devices in terms of their specialities;

2.1.a. Servers: These are serving computers. They can also be called as host computers. They are used to transfer data prepared by experts to students in education. There are servers giving various services. These are database server, web server, wap server, sms server, e-mail server, file server, Proxy servers.

2.1.b. Laptop Computers: These computers' quantities exceeded those of desktop computers because of their prices being low in today's world. Laptop computers have much more features than some desktop computers in terms of equipment. With their features of being portable and plug and play, as well as with the development of mobile communication technologies and the facility of internet connection almost everywhere, laptop computers' usage in mobile learning is unquestionable.

2.1.c. Tablet PCs: It is one of the newest of mobile technologies. With the development of private operating systems, its utility has increased recently. With the progress of mobile communication technologies and placement of these technologies within tablet PCs, their utility became unquestionable in mobile learning. They are less heavy than laptop computers in terms of equipment, but they are more expensive. And they are heavier than smart phones, but in terms of screen sizes and usage facilities, they appear to be more convenient than smart phones.

2.1.d. Pocket phones (PDA): Today, pocket phones are close to personal computers technologically and can perform most of the work of personal computers, with the development of mobile software products and mobile operating systems such as Microsoft Windows Mobile, Symbian OS. Even, some models can be used as computer and mobile phone, therefore they provide accession to data in any circumstance. Their bigger screens than those of mobile phones were seen as an advantage in terms of mobile learning, but this advantage has been removed because of the wideness and touchability of screens of new phones. The constantly-progressing technology of mobile phones have navigated PDAs' usage to mobile phones which are close to smart phones. In addition, people are more liable to use netbooks which are newly produced for pocket phone applications and contribute to the development of 3g technology.

2.1.e. Smart phones: Smart phones are combined devices. These mobile devices possess both pocket computers' abilities and sim card slots' and mobile phones' abilities. Their sizes, smaller than PDAs and bigger than mobile phones, have become more ergonomic with the progression of technology. Thanks to their touchable or keyed keyboards, they meet the needs of users. They can be used with operating systems such as Microsoft Windows Mobile, Symbian OS etc. these devices, used successfully in multimedia learning, are without doubt among important devices of mobile learning with their abilities to connect internet, operate Office programmes etc.

2.1.f. Mobile phones: Mobile phones, basically used to communicate vocally and send and receive written messages, have become very important in mobile learning with the development of communication technologies. Especially, 3g technology, new generation communication technology, has increased the utilization of mobile phones by transmitting not only voice and writing, but also instant displays, videos and moving images. Today, mobile phones compatible with 3g technology can be bought for low prices and communication via e-mail is possible when adjusted. However still, small sizes of their screens and expensive usage of communication technologies (3g, wap, gprs, edge, sms etc.) are seen as a disadvantage.

2.1.g. Other mobile devices: Portable media players, digital media receivers, game consoles, video players.

2.2. Online Status:

The instant communication status between a mobile device and a server is called online status. It is the connection of a mobile device to a server. Online status has important advantages in m-learning. Because in m-learning, the 'up-to-date' situation of data is as important as the accession to that data.

2.3. Offline Status:

Non-communication status between a mobile device and a server is called offline status. There are advantages of offline status in m-learning. These are; speed, direct accession to application and place independence. In the moment of an accession to any data, data is received immediately because it is received directly from the device. On the other hand, no matter how high are the connection technologies speeds, it still takes more time to connect a server in an online status. In addition, in offline status, there is no communication cost because there is no connection with any server. However, in the need for accession to a up-do-date information, this accession situation is a serious disadvantage.

With the developing technology, communication technologies used by mobile devices differ from each other. In this section, different wireless communication network technologies used by mobile devices to communicate and their sub-stages are analyzed.

2.4.a. Wireless

Wireless network communication technology is a mobile communication technology used for internet (global network) and intranet (domestic network) and available in almost every mobile device today. It is available in laptop and tablet computers as default. In order to redound this opportunity to other devices, wireless adaptors can be used. Standards of wireless communication technology exist. There are; IEEE 802.11g, IEEE 802.11a and IEEE 802.11b. 802.11g standard is a standard developed basically above 802.11b Standard and its data transfer speed is double fast. The data transfer speed of IEEE 802.11a Standard is five times faster than those of IEEE 802.11b.

2.4.b. GSM (Global System for Mobile)

It is a mobile communication technology developed basely on GSM 2g technology which means global system for mobile communication. Its frequency range is 900 – 1800 – 1900. And its band width is 9,6 – 28,8 kbps.

2.4.c. GPRS (General Packet Radio Service)

General packet radio service exists in smart phones and pocket phones with GPRS as default. It serves as 2,5G. Although its speed is low, it became a technology usually-utilized in mobile devices before 3g communication technology. However, fast and alternative solutions which 3g offers have decreased the usage of GPRS. Its frequency range is 900 – 1800 – 1900. And its band width is 171,2 – 384 kbps.

2.4.d. Bluetooth

It exists in most of laptop computers, tablet computers, pocket computers and smart phones as default. To redound Bluetooth for devices without Bluetooth communication technology, Bluetooth apparatus can be used. The above-mentioned devices can communicate each other via Bluetooth technology. The fact that Bluetooth technology, which has a big advantage with being available in all devices as default, has low transfer speed is a disadvantage.

2.4.e. Infrared (IrDA)

It exists in laptop computers, tablet computers, pocket computers as default. Other devices can obtain this technology by using infrared apparatus. This communication technology can be seen advantageous, but its speed of communication, low range, and possibility of dis-communication are its disadvantages.

Sample usages: In order to redound online communication possibility to a pocket computer which is without a phone feature, Pocket Computer + IrDA (infrared data association) + Mobile Phone can be used.

2.4.f. Edge

Enhanced Data rates for GSM Evolution, EDGE, meaning increased data speed for GSM development, is the former step of 3G, third generation communication technology. It renders possible to transfer data 380 kbps per second. It is the communication technology Standard which is within the 2G technology.

2.4.g. 3G Technology

It is the abbreviated form of 3rd generation communication services. It is the 3N or mostly used 3rd generation wireless mobile communication technology. 3G communication technology, which has various technologies and differences, serves according to WCDMA-UMTS-HSDPA standards. We can assume two standards as effective which are used by mobile devices in 3G technology. These are; UMTS (Universal Mobile Telecommunications System) and HSDPA (High Speed Downlink Packet Access). 3G's frequency range is 1900 – 2200. Its band width is 2000 kbps and over. 3G is the name of third generation wireless communication technology. It uses 1G and 2G cellular network system. In 3G, not only voice but also numeral data is transferred. Because 3G provides high speed safe data communication, it renders possible to use texting, communication and connection to internet more fastly and safely relatively to old communication technologies. One of the biggest advantages of 3G technology is navigation. First used in Japan in 1998, 3G communication technology was used in Europe as from 2003.

2.4.h. 4G Technology

4th Generation Services, 4N or 4G, are fourth generation wireless mobile communication technology. Because it doesn't use cellular network system like other GSM standards, it is expected to solve some problems, especially network coverage problem which occurred in former generations. Its connection speed is 100Mbps in mobile phones and 1Gbps in wireless networks. Its band width is the same as wimax band width. 4G technology is based on higher data speed than former generations and connection will be solved basely on IP. 4G communication technology will be the new generation communication technology by serving any network service in any time and place with its service quality and safety.

- It can be used in projects of multi-persons, shortly in projects and studies requiring cooperation.
- It can be used in situations of being in different places of learners.
- It can be used as an alternative class to classes, laboratories, boks and offline computers.
- It can be used in education of just-in-time workers requiring instant communication. Institutions can use these kind of studies to educate their personells and to increase their efficiencies.

3. Conclusion

Usage of mobile learning (m-learning) technologies in education is the most important of required technologies to provide main goals in distance education. It offers learning and data accession oppourtunities to learners notwithstanding time and place. Many various technologies are developed for mobile environments in terms of redounding opportunities of data transfer, data protection and online communication. The fact that mobile technologies progress and it meets people's needs faster, has increased the interests in mobile technologies and their usage. Moreover, by solving scanning problems faced in accession to education environments and servers by mobile devices, online accession opportunities are provided from all mobile technologies. The development of mobile technologies has provided important advantages in works of experts as well as for those in need of data.

With the above-mentioned advantages, it is now easier to learn and to access data for individuals in need of data notwithstanding time and place, and both learners and experts are benefiting from these advantages.

In conclusion, the development of mobile technologies and their ongoing progress have raised the interests of mobile learning (m-learning) and have contributed much to every field of education.

4. References

- Isman, A., (2006), Computer and education, Sakarya University Journal of Education, Volume: 2 Web Site: <http://www.ef.sakarya.edu.tr/dergi/efdergisayi1.pdf>, 24.11.2006.
- Alkan, C., (2002), Anadolu University Status, Symposium on Open and Distance Education Web Site: <http://aof20.anadolu.edu.tr>, 23-25.05.2002.
- Bulun, M., Gulnar, B., Guran, S.M., (2004), Mobile Technologies in Education, The Turkish Online Journal of Educational Technology – TOJET April 2004, ISSN: 1303-6521, volume 3, Issue 2 ,Article 23.
- Dincer, S., (2006), Computer Aided Education and Distance Education: An Overview, Web Site: <http://ab.org.tr/ab06/bildiri/90.doc>, 18.11.2006.
- Laouris, Y., Eteokleous, N., (2005), We Need an Educationally Relevant Definition of Mobile Learning, www.mlearn.org.za/CD/papers/Laouris%20&%20Eteokleous.pdf, 20.08.2010.
- Georgiev, T., Georgiev, E., Smrikarov, A., (2004), M-Learning - a New Stage of E-Learning, International Conference on Computer Systems and Technologies - CompSysTech' 2004, Web Site: http://74.125.155.132/scholar?q=cache:XFz3hxpCfGAJ:scholar.google.com/+m-learning&hl=tr&as_sdt=2000, 17.08.2010.
- Girginer, N., (2001), Pure Distance Education Restructuring for Pass, Web Site: http://aof20.anadolu.edu.tr/bildiriler/Nuray_Girginer.doc, 25.11.2006.
- Grosso, C. D., (2003), Progress Report – Change Manager, Web Site: http://www.flexiblelearning.net.au/leaders/fl_leaders/fl03/interim/del_grosso_cynthia_progreport.pdf, 20.08.2010.
- Web Site: <http://tr.wikipedia.org/wiki>, 25.08.2010.
- Web Site: <http://www.tuik.gov.tr/>, 20.08.2010.
- Web Site: http://bote.yyu.edu.tr/UES/proje2/doc/e_ogrenme.doc, 22.08.2010.
- Harris, P., (2001), Goin' Mobile, Web Site: http://www.astd.org/LC/2001/0701_harris.htm, 20.08.2010.
- Inceoglu M. M., Donmez, O., Gelibolu, M. F., (2006), The New Face of Technology in Education: Mobile Learning, IETC 19-21.04.2006 Gazimagusa KKTC.
- Keegan, D. , (2002), The future of learning: ZIFF papiere 119: From eLearning to mLearning, Web Site: http://www.fernuni-hagen.de/ZIFF/ZP_119.pdf , 19.08.2010.
- Mutlu, E. M., Yenigun, U.H., Uslu, N., On education, mobile learning: Open e-Learning Services Evaluation of the Possibilities of Utilization of Mobile Computing devices, Web Site: http://74.125.155.132/scholar?q=cache:_ta8EJ480YwJ:scholar.google.com/+mobil+%C3%B6%C4%9Frenme+nedir&hl=tr&as_sdt=2000, 17.08.2010.